

Unit Planning Guide: Grade 11 Unit 1 of 4

Unit Title: Real Numbers, Quantity, and Closure	Pacing (Duration of Unit): 1 quarter (10 weeks)
Grade: 11	Buffer Day(s):

Desired Results

Transfer Goals (Priority practice standards in **bold**)

Students will be able to independently use their learning to:

- MP.1. **Make sense of problems and persevere in solving them.**
- MP.2. Reason abstractly and quantitatively.
- MP.3. Construct viable arguments and critique the reasoning of others.
- MP.4. **Model with mathematics.**
- MP.5. Use appropriate tools strategically.
- MP.6. Attend to precision.
- MP.7. **Look for and make use of structure.**
- MP.8. **Look for and express regularity in repeated reasoning.**

Established Goals (2011 MA Curriculum Frameworks Standards Incorporating the Common Core State Standards)

Prerequisite Standards:

- **CED.A.1** Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*
- **8.EE.A.1** Know and apply the properties of integer and exponents to generate equivalent numerical expressions. For example $3^2 \times 3^5 = 3^{-3} = \left(\frac{1}{3}\right)^3 = \frac{1}{27}$
- **8.EE.C.7**
 - a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until and equivalent equation of the form $x = a$, $a = a$, $a = b$ results (where $a \neq b$)
 - b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
- **8.F.A.1** Understands that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.
- **8.F.B.5** Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g. where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

WIDA for English Language Learners

- Standard 1: ELLs **communicate** for **Social** and **Instructional** purposes within the school setting
- Standard 3: ELLs **communicate** information, ideas and concepts necessary for academic success in the content area of **Mathematics**
- In the lesson planning stage, teachers will need to differentiate lessons for ELLs. In order to accomplish this they will need: 1.) this curriculum map, 2.) a list of their ELLs and their proficiency levels, and 3.) appropriate language function expectations and scaffolds or supports.

Unit Planning Guide: Grade 11 Unit 1 of 4

Standards (Priority Standards in **bold**):

- **A-REI.1.** Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
- **N-RN.1.** Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.*
- **N-RN.2.** Rewrite expressions involving radicals and rational exponents using the properties of exponents.
- **A-REI.2.** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
- **A-REI.11.** Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★
- A-REI.4. Solve quadratic equations in one variable.
- Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
- Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b .
- MA.4c. Demonstrate an understanding of the equivalence of factoring, completing the square,
- N-Q.2. Define appropriate quantities for the purpose of descriptive modeling.
- A-REI.6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
- A-REI.7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.

Unit Planning Guide: Grade 11 Unit 1 of 4

Meaning (*Mostly assessed through Performance Tasks/Assessments)

Big Ideas: (Statements and concepts written in teacher friendly language which reflect the important [but not obvious] generalizations we want students to be able to arrive at. These are used by the teacher to focus daily instruction.)

- Subsets of the Complex Number system have particular properties under different operations, some having closure and some not.
- Real-world situations can be modeled using a variety of representations
- Key features of those representations provide clues to both interpreting and building mathematical models
- Solutions to real-world problems are limited by constraints, which can affect the interpretation of the problem in the context
- Examining two or more functions graphed on the same coordinate plane can be helpful in identifying solutions, where they exist, and can clarify why solutions may not exist.

Essential Questions: (Questions which frame ongoing and important inquiries about the big ideas. They are written for students and used in daily instruction to help engage students in meaningful thinking.)

- Why are counterexamples important in mathematics?
- What types of considerations for mathematical models are important in the context of real world problems?

Acquisition (*Mostly assessed through traditional summative assessments)

Knowledge: Key basic concepts, facts, and key terms (written in phrases) students should be able to recall independently.

Students will know ...

- That the Real number system has subsets, some that overlap
- The properties of exponents, both integer and rational
- That the Real number system is a subset of the Complex number system
- That Imaginary numbers are derived from even roots of negative numbers.
- The difference between a linear and a quadratic function using a variety of methods.
- How to determine whether a quadratic or linear model is appropriate.

Skills: The discrete skills and process students should be able to use independently.

Students will be skilled at:

- Solving equations and being able to identify extraneous solutions. (Comprehension)
- Identifying the point of intersection of two or more functions is a solution to that system and that two or more functions that are analyzed on the same coordinate plane may have no solutions, one solution, or infinite solutions. (Application, Analysis)
- Using properties of exponents, including rewriting expressions involving radicals and rational exponents. (Application, Analysis)
- Use $a + bi$ notation for complex numbers, and calculate using arithmetic operations, including determining the conjugate of a complex number and rationalizing denominators. (Comprehension)
- Approximating solutions eg. using technology to graph functions, making

Unit Planning Guide: Grade 11 Unit 1 of 4

	<p>tables of values, or finding successive approximations. (Analysis)</p> <ul style="list-style-type: none">• Solving and interpreting simultaneous linear and/or quadratic equations or inequalities algebraically and graphically (Evaluation)• Calculating and interpreting finite differences, a.k.a slope (Synthesis)
--	---

Resource Suggestions:

-
- <http://www.nctm.org/>
- <http://www.illustrativemathematics.org/>
- <http://youtube.com/> → Khan Academy
- <http://www.doe.mass.edu/candi/commoncore/>